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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/260,478	03/01/1999	IONEL JITARU		6598

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EXAMINER

LAXTON, GARY L

ART UNIT PAPER NUMBER

2838

DATE MAILED: 04/04/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/260,478

Applicant(s)

TITARU, IONEL

Examiner

Gary L. Laxton

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— The MAILING DATE of this communication appears on the cover sheet with the corresponding address —  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 30 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments with respect to claims 1-7 have been considered but are moot in view of the new ground(s) of rejection.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 and 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto et al in combination with Tan et al.

Okamoto et al disclose an AC source of power, the rectifier as claimed and an inductor connected between the AC source and an input terminal to the rectifier.

However, Okamoto et al do not disclose the AC power source as having a dead time.

Tan et al teach connecting an AC power source with dead time to a rectifier circuit for providing an efficient soft switching converter circuit for converting AC voltage into regulated DC

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voltage. Therefore, since providing efficient converter circuits to produce a nice regulated DC voltage is highly desirable, it would have been obvious to one having ordinary skill in the art at the time the invention was made given the circuit of Okamoto et al in combination with the teachings of Tan et al to provide an AC power source that includes dead time in order to provide an efficient soft switching circuit which would produce an efficient and well regulated DC voltage which is highly desired from the energy efficient demands of today's electronic circuits. Furthermore, it is Tan et al teach adjusting the timing of the switches in order to control the output voltage by changing the dead time and controlling the current. Cols. 6 and 7 as well as figures 2A-2F and figure 3 teach how obvious it would be to control the secondary inductor current to be at zero or to be near zero before changing polarity.

4. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto et al in combination with Tan et al and further in combination with Bowman et al or Dittli et al.

Okamoto et al in combination with Tan et al disclose the invention as stated above in regards to claim 1 except for replacing the diodes of the rectifier with synchronous rectifiers.

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It is well known in the art that with the increasing requirement in applications such as computers for power supplies for even lower supply voltage, the conduction loss in the diode output rectifier becomes the biggest source of power loss in switching power supplies. Even the commonly used Schottky diodes have a relatively large voltage drop and, hence, a large power loss in such low-output-voltage applications. Consequently, low-voltage metal-oxide-semiconductor field-effect transistors (MOSFETs), which operates in the third quadrant, with a very low on-state resistance and fast switching speed can be used to replace the diodes in the output stage. Because the gate signal to the low-voltage power MOSFET is provided in synchronism with the drain-source voltage to maintain low on-resistance in one direction and blocking state in another direction, the low-voltage power MOSFET in these applications is called a synchronous rectifier (SR). Low-voltage power MOSFETs are successfully used as SR because of their linear  $V-I$  characteristic. The conduction loss can therefore be reduced to a very low value by paralleling more MOSFETs. The SR is also fast because it is a majority carrier device. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize synchronous rectifiers in place of the diodes in order

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to reduce conduction losses as is well known in the art that synchronous rectifiers provide.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto et al in combination with Tan et al and further in combination with Trousdale and still further in combination with Schutten et al.

Okamoto et al in combination with Tan et al disclose the claimed invention as stated above in regards to claim 1 except for connecting a switch between the input terminals of the rectifier circuit.

Trousdale teaches connecting a switch between the inputs of a rectifier circuit. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to connect a switch between the input terminals of a rectifier circuit to provide a new and improved electronic switch which may serve as a pulsing relay in applications where the controlled circuit may be of either polarity and where no direct current flow is permissible between the controlled circuit and the pulsing relay driving circuit.

However, Trousdale does not teach the switch being bi-directional.

Schutten et al teaches of connecting a bi-directional switch between terminals of a rectifier circuit. Therefore, it would

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have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a bi-directional switch in place of Trousdale transistor switch for shaping voltage or current waveforms.

### ***Conclusion***

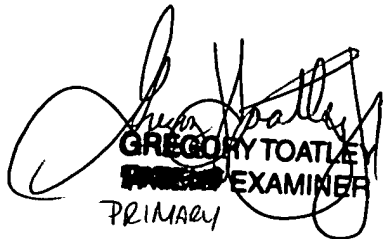
6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. 5,510,972 Wong discloses Bridge rectifier circuit having active switches; 5,793,624 Couture et al discloses AC source leading into an inductance leading into a rectifier circuit having two controlled switches.

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7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gary L. Laxton whose telephone number is (703) 305-7039. The examiner can normally be reached on 5-4-9.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Nappi can be reached on (703) 308-3370. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-7724 for regular communications and (703) 305-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

  
GREGORY TOATLEY  
PRIMARY EXAMINER  
PRIMARY